Standard Operating Procedure for Electrometric pH

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1.0 Scope

1.1 This method is applicable to drinking, surface, and saline waters; domestic and industrial wastes.

1.2 The working range is 6.0 to 10.0 pH units.

2.0 Summary of Method

The pH of a sample is determined electrometrically using a glass electrode in combination with a reference electrode, or with a combination pH electrode.

3.0 Sample Handling and Preservation

3.1 Samples are collected in clean glass or plastic containers. They should be completely filled whenever possible.

3.2 Sample are stored at 4°C. They are considered stable for at least 24 hours.

4.0 Interferences

4.1 Any sample constituent which coats the electrode can cause sluggish response. The electrodes must be kept clean.

4.2 Temperature effects on the electrometric measurement of pH arise from two sources. The first source is caused by change in electrode output at various temperatures. This can be avoided by using an instrument with automatic temperature compensation. The second source is the change of pH inherent in the sample at various temperatures. Both sources of variation are avoided by conducting all measurements and standardization at 25°C.

5.0 Apparatus

5.1 pH meter, such as the Accumet 25

5.2 Electrodes

5.2.1 A glass electrode and a reference electrode may be used.

5.2.2 A combination pH electrode, such as Orion Ross type epoxy body.

6.0 Reagents

6.1 Reagent Water

6.2 Calibration Standards: Standard buffers are commercially available. Buffers of 7.00 and 10.00 are used for calibrating the instrument. Graduated cylinders should be used for dilution of the buffer concentrates.

6.3 Control Standards: Commercially available buffers 6.86 and 9.18 are used for low and high control standards for lake water samples. Graduated cylinders should be used for dilution of the buffer powder packets.

7.0 Calibration

Calibrate the pH meter according to the manufacturer's instructions.

7.1 All standards and samples are brought to 25°C before use.

7.2 All standardizations are preceeded by rinses with material to be used for calibration.

7.3 A pH 7.0 buffer is placed on the apparatus and the stand key is pressed.

7.4 When the meter so indicates, rinse the apparatus with reagent water and then buffer 10.

7.5 A pH 10.01 buffer is placed on the apparatus and the slope key is pressed.

7.6 The meter will indicate when the standardization is complete.

8.0 Analytical Procedure

8.1 All samples and standards are brought to 25°C before use.

8.2 Rinse the electrodes and other equipment contacting the sample with reagent water.

8.3 Pour an aliquot of sample into a suitable container. Place the sample onto the stirrer and electrode and stir it moderately rapid without breaking the surface.

8.4 When the meter stabilizes, record the pH reading.

8.5 Analyze control standards in the same manner.

8.6 When all measurements are complete, store the electrode in pH 7.0 buffer.

9.0 Calculations

The pH values are determined directly from the meter readings.

10.0 Quality Control

10.1 GLNPO Electrometric pH

Two Control standards are run once per 12 hour shift, or once every two stations, whichever is less. The check standards have values of 9.18 and 6.86.

11.0 Troubleshooting/Corrective Action

11.1 Problems associated with non-linearity can generally be traced to a defective electrode or one or more defective buffer solutions.

11.2 A sluggish response may be due to a dirty electrode membrane or a plugged junction in the reference electrode, or inadequate reference electrode solution. A dirty membrane can sometimes be cleaned with ethanol or 1 N NaOH (three or four minutes with the stirrer running).

12.0 References

EPA Publication, March 1979. "Methods for Chemical Analysis of Water and Wastes". EPA #600/4-79-02.

Standard Methods for the Analysis of Water and WasteWater, 16th Edition APHA-AWWA-WPCF.